

ABSTRACT OF THE DISCLOSURE

The present invention comprises a dynamic interphase-loading apparatus (DILA) and method for testing the interfacial shear strength, stress-strain response, energy absorbing capability and durability (fatigue life, residual strength after fatigue loading or exposure to a hygrothermal environment) of an interphase region of a fiber/matrix composite under quasi-static to <sup>dynamic</sup> high strain rates. The apparatus utilizes the fast expansion capabilities of a piezoelectric actuator to provide a load to the fiber/matrix interphase under high loading rates. The piezoelectric actuator generates displacement rates typically in the range of quasi-static to 4500  $\mu\text{m}/\text{sec}$ . The apparatus further includes means for continuously monitoring the load applied to the fiber/matrix composite and providing a signal representative thereof, and means for monitoring the displacement of the interphase of the fiber/matrix interphase and providing a signal representative thereof. The apparatus further comprises a computer that has high frequency data acquisition ability for receiving the load signal from the load monitoring means, for receiving the displacement signal from the displacement monitoring means, and for generating input to the piezoelectric actuator. The computer includes a memory device connected to a processor, wherein the processor stores the load signal in the memory device, generates the control signal supplied to the piezoelectric actuator, and generates information representing the mechanical properties of the interphase of the fiber/matrix composite.

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